The Effect of Wage Dispersion on Satisfaction, Productivity, and Working Collaboratively: Evidence from College and University Faculty

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Using a large sample of college and university faculty, we studied the effects of wage inequality on satisfaction, productivity, and collaboration. Results show that the greater the degree of wage dispersion within academic departments, the lower is individual faculty members' satisfaction and research productivity and the less likely it is that faculty members will collaborate on research. The negative effects of wage dispersion on satisfaction are reduced for people who are more committed (have longer tenure), in fields with more developed scientific paradigms, and when salaries are based more on experience and scholarly productivity, but they are greater for those who earn comparatively less money. Wage dispersion has a smaller negative effect on satisfaction in private colleges and universities in which salaries are less likely to be known. The results suggest that one's position in the salary structure, the availability of information about wage inequality, and legitimate bases of reward allocation all affect the extent to which wage dispersion produces adverse effects.[*]

There is currently a theoretical dilemma in the literature about reward allocations in organizations. On the one hand, theoretical approaches ranging from economics (Bishop, 1987), to expectancy theory (Porter and Lawler, 1968; Lawler, 1973) and operant conditioning in psychology (Luthans and Kreitner, 1975) argue for the positive benefits of making pay contingent on performance. On the other hand, economists, such as Lazear (1989), Frank (1984), Levine (1991), and Milgrom and Roberts (1988), and psychologists, such as Deutsch (1985, 1986), have noted that pay compression or even pay equality is desirable to promote harmonious social relations in the workplace as well as cooperation, effort, and commitment. Hicks (1963: 317) pointed out that the labor market is social as well as economic and that efficiency can't be assessed by comparing workers' wages with their value to the employer; "it is also necessary that there should not be strong feelings of injustice about the relative treatment of employees since these would diminish the efficiency of the team." Barnard (1938: 145–146) also recognized that monetary rewards are social and relational, emphasizing that differences in monetary rewards are assumed to reflect differences in recognition or distinction and "are a source of jealousy and disruption if not accompanied by other factors of distinction." Because organizational rewards are social, as noted by Hicks and Barnard, the individual incentive effects of contingent and differentiated rewards must be set against their impact on social relations in the work group and individual attitudes and perceptions of justice.

Thus far, there has been much more theoretical writing about the effects of reward structures than there has been relevant empirical evidence. Some studies are consistent with the view that compressed, more equal rewards are desirable. For instance, a set of studies has shown that wage dispersion is positively associated with unionization (Hirsch, 1982), voting for unions in representation elections (Dickens, Wholey, and Robinson, 1987), and with individual preferences for unions (Farber and Saks, 1980). These

results suggest that workers do not like wage dispersion, and it may cause them to bring in an institution, a labor union, that will reduce wage dispersion (Freeman, 1982). Cowherd and Levine (1992), in a study of 89 corporate business units, found that the smaller the difference in wages between hourly and lower-level exempt employees and upper management, the greater was product quality. Pfeffer and Davis-Blake (1992), studying college administrators, found that the greater the wage dispersion, the more likely it was that lower-paid administrators would leave their positions.

Other studies are consistent with the view that paying for performance and having more differentiated rewards produces positive effects. Mitchell, Lewin, and Lawler (1990) reviewed a number of studies that found that individuals paid under incentive plans earned more than those paid on an hourly basis, which presumably means they were more productive. Abowd (1990) found some evidence that managerial pay-for-performance systems increased after-tax economic returns and shareholder returns. Using data from a single firm, Kahn and Sherer (1990) concluded that managers whose performance significantly influenced their bonuses had higher future performance levels than other managers. Leonard (1990) found a significantly higher average return on equity in firms with bonus systems than in those without them.

Many of these analyses use individual-level data and do not consider the effects on performance of the distribution of pay and other incentives in the organization or the consequence of any social comparison processes. The relative importance of individual incentive (and sorting) effects provided by differentiated, contingent reward schemes compared with the social harmony, cooperation, and commitment produced by more equal rewards cannot be assessed once and for all. The effects of reward distributions on both organizations and individuals will certainly depend on factors such as the nature of the task (Jacobs, 1981) and the characteristics of both the organization and the individuals, which remain to be specified and empirically examined. One of the more useful avenues for research on pay systems may be precisely this task of determining not which pay scheme is best but, rather, under what conditions salary dispersion has positive effects and under what conditions it has negative effects.

This article advances the process of specifying the conditions that may determine how reward distributions affect people, both in terms of attitude and behavior. We investigate how wage dispersion and pay regimes affect an individual's attitude, satisfaction, research performance, and collaborative working relationships, using data from a large sample of college and university faculty. We also consider how conditions related to the pay-determination process, the information about pay distributions that is available, and the individual's level of commitment to the organization mediate the effects of wage dispersion. This paper does not discuss the causes of wage dispersion, an issue that has been explored elsewhere (Freeman, 1982; Pfeffer and Langton, 1988; Pfeffer and Davis-Blake, 1990). By looking at a

number of dependent variables potentially affected by the distribution of salaries, we are able to see if, at least in this context, there are consistent effects of wage dispersion or whether there are trade-offs, with performance being enhanced and job satisfaction diminished by more dispersed, performance-based systems of salary allocation.

THE EFFECTS OF WAGE DISPERSION

Satisfaction

Although there is some evidence that contingent pay systems have positive performance effects, there is little evidence that wage dispersion, per se, is positively associated with satisfaction. Reviews of the existing literature by Leventhal (1976) and Deutsch (1985) both suggest that wage dispersion will be negatively related to satisfaction, and that is the main effect we would expect to find here.

A given individual's reactions to a specific reward distribution will be affected by his or her place in that distribution, by whether or not the distribution is perceived as being equitable or fair, by whether or not the person has information about the distribution and his or her place in it, and finally, by the person's relationship and commitment to the organization.

Location in the salary structure. People assess the adequacy of their rewards through a process of social comparison (Festinger, 1954). Because of the importance of social referents for anchoring judgments about pay and other characteristics of work (e.g., O'Reilly and Caldwell, 1979), both the level of an individual's rewards and the distribution of rewards across other organizational members is important. As Brickman (1975: 191) pointed out, "the value of a given reward is not absolute, but is relative to other rewards with which it is compared . . . satisfaction with a modal score should be higher when it can be compared to a less favorable alternative . . . than when it has only equal comparisons."

When one evaluates one's well-being through comparison, one's place in the salary distribution is an important determinant of how one reacts to wage dispersion. In particular, people earning more should not necessarily be dissatisfied by dispersed earnings distributions, for, in such distributions, they are comparatively better off. Conversely, people earning less money are comparatively worse off in a more dispersed earnings distribution and, therefore, should be more dissatisfied. Our first hypothesis, then, is that the individual's reaction to wage dispersion will be significantly affected by his or her own salary, with high earners either preferring wage dispersion or finding it less aversive, and people earning less money being more dissatisfied when earnings are more unequal.

Fairness and reactions to wage inequality. Both equity and distributive justice arguments (e.g., Greenberg, 1982, 1987) suggest that inequality should be more aversive to the extent that rewards are not allocated on a fair or just basis. One problem with the literature, as Greenberg (1982) noted,

is that what is fair or just is open to interpretation. Jasso (1983) noted that people will perceive an allocation system as fairer when the rankings of people made on the basis of reward-relevant characteristics are similar to the rankings within the salary distribution. Birnbaum (1983) noted that reward allocations based strictly on merit will not be perceived as fair when there are large salary differences between two people of equal merit. He argued from his work on faculty salaries that "there appears to be a consensus that a person with high merit and low salary deserves a greater raise than a person whose salary is high for his or her merit" (Birnbaum, 1983: 56).

In this study, we argue that perceptions of fairness are related to at least two components of the reward-allocation system—the extent to which rewards are based on criteria that are normatively valued and the extent to which there is consensus on the evaluation process and criteria. According to Ferber and Loeb (1974: 69), "no one takes greater pride in rewarding people for merit alone than academicians." In academe, merit is most often related to research productivity. In studies of academic wage determination (e.g., Ferber and Kordick, 1978; Tuckman, 1979; Ferber and Green, 1982), research productivity is inevitably taken to be a measure of performance and always appears as a significant determinant of salaries. Basing salaries on research productivity, then, should be perceived as comparatively fair and just in this setting. Similarly, seniority is also often perceived as being a socially legitimate way of allocating rewards. Studies have frequently shown that seniority is at times an even more important predictor of wages than performance (e.g., Bishop, 1987; Medoff and Abraham, 1980, 1981). Finally, wage-determination systems that combine seniority, productivity, and credentials to determine wages should be perceived as fairer and more just than ones in which these factors are less important in determining reward allocations.

For college and university faculty, consensus on the standards of evaluation is captured in the construct of the level of paradigm development. Lodahl and Gordon (1972) argued that paradigm development represents the extent to which there is consensus within a scientific field about what are the important research problems, what are appropriate methodologies, and agreement on curricula and training processes. It seems logical to expect that in more highly developed fields, just as there is more consensus on the evaluation of research (Hargens, 1988), there will be more consensus on the evaluation and merit of researchers. Reward differentiation thus should be more widely understood and accepted in more developed disciplines because of the higher level of agreement on standards.

We hypothesize that wage inequality should be less dissatisfying when it occurs in a field that is more paradigmatically developed and when it occurs in a department in which there is a stronger relationship between pay and either seniority or productivity, and when salaries are more fully determined by seniority, productivity, and credentials. At first glance, there is an apparent dilemma

in our argument that needs to be explicitly addressed. On the one hand, we argue that salary dispersion based on legitimate and normatively valued factors such as experience or research productivity should make dispersion less dissatisfying. On the other hand, to the extent that rewards are allocated on the basis of factors such as academic productivity that vary substantially over individuals, wage dispersion increases. This contradiction is, on close inspection, not real. It is quite possible, and, even likely, that people may prefer more equal salary distributions; however, a given degree of inequality is accepted more readily when it is produced by more legitimate or meritocratic criteria.

The effect of information. The bases of reward allocation and the certainty or disagreement associated with the criteria provide the conditions under which dispersion is either more or less accepted. The extent to which an individual's inputs (e.g., productivity, seniority, or experience) and rewards are known to others provides the basis for problems to arise in the first place. People cannot be dissatisfied unless they have something to be dissatisfied about, and that requires knowledge of what others are receiving. Thus, we hypothesize that conditions that make wage dispersion more completely known will tend to increase the effect of wage dispersion on dissatisfaction, particularly for those who earn less. This argument contradicts Lawler's (1971) assumptions about the effects of pay secrecy: that if pay information were not disclosed, people would assume the worst and think they were faring worse than they actually were. But in a study of college and university faculty salary differences by academic discipline and rank, Hamermesh (1988: 24) noted that "when people's satisfaction . . . is based on their relative standing, more information about salaries can at some point be undesirable" and lead to unhappiness. A literature in psychology suggests that people will seek to avoid discrepant or unpleasant information (e.g., Cialdini, 1984), but although individuals may seek to make themselves unhappy to steel themselves for bargaining over wages, it is likely that most of the time they would prefer to remain ignorant, particularly of an unfavorable location in the distribution of organizational rewards.

Our hypothesis is consistent with the results of an experimental study by Leventhal, Michaels, and Sanford (1972), who observed that pay allocations were more unequal when they were kept secret. They argued that keeping more unequal pay allocations secret was a mechanism for avoiding conflict in the group. To the extent pay allocations are known, they are more likely to be less dispersed (Pfeffer and Langton, 1988), but to the extent that allocations are known, a given degree of dispersion will be associated with more dissatisfaction.

Information on salaries is more likely to be public in public colleges and universities. Pfeffer and Langton (1988) observed less pay dispersion in public organizations. Tolbert (1986) found smaller male-female earnings differentials in public than in private colleges. We argue that not only will there be less wage dispersion in public organizations but,

because of the openness of salary information in public organizations, a given degree of wage dispersion will be associated with more dissatisfaction.

Salary information is also disseminated through informal social communication (Festinger, 1950), within one's own department, with others in the same field at other institutions, and even with others who aren't related in any organizational or professional way. Communication with others inside the organization should make one's own position in the salary distribution better known, and communication with others outside the institution may provide more knowledge of one's position in the external market. In both cases, better knowledge of one's position in the salary distribution is likely to make wage dispersion more dissatisfying, particularly for people earning less money. Consequently, we expect that people who are in closer social contact with others inside their own department and who have more frequent communication with others in their field in other institutions will experience more dissatisfaction as a result of wage inequality.

Commitment

The literature on commitment (e.g., Salancik, 1977; Staw, 1980) suggests that people come to terms with their situations. Katz (1978) found that job attributes were not as strongly related to job attitudes for people who had been in their jobs longer. Pfeffer and Lawler (1980) observed a diminished relationship between salary and satisfaction for people with longer tenure, who were presumably more committed to their organizations. Analogously, we would argue that to the extent people have longer tenure in their institutions, and therefore greater commitment (Sheldon, 1971) the relationship between wage dispersion and dissatisfaction should be attenuated.

Commitment is also related to one's place in an organization's social structure. Department chairpersons and other administrators should exhibit less dissatisfaction with wage dispersion because their institutional position will undoubtedly make them more committed.[1]

Performance

It may be the case that although dispersion negatively affects satisfaction, tying wages to productivity may benefit the firm. Bishop (1987: S37) noted three such benefits: "First, it serves as an incentive for greater effort. Second, it tends to attract to the firm more able workers and those who like to work hard. . . . Third, it reduces the probability of losing the best performers to other firms and raises the probability that the least productive workers will leave." Other writers have also noted the incentive effects of paying on the basis of performance (Porter and Lawler, 1968; Luthans and Kreitner, 1975; Leventhal, 1976).

Although paying for performance is likely to increase wage dispersion, a high degree of wage dispersion by itself does not necessarily imply that a pay-for-performance scheme exists. Dispersed wages can result from the operation of favoritism or rewards for things other than performance. Firms can force managers to evaluate employees on a curve

[1]
These people may also be responsible for the distribution of rewards in the first place and therefore be less affected by that distribution.

and provide raises with more variation, as did the Bank of America with the pay program it implemented in the 1980s. These differentiated rewards can (and often are) based on things other than performance, such as the quality of one's relationship with the person doing the ratings. Thus, although many recent writers have argued that there is insufficient differentiation in rewards on the basis of performance to provide sufficient incentives for effort (Bishop, 1987; Baker, Jensen, and Murphy, 1988), wage dispersion and paying for performance are both conceptually and empirically independent.

We explore here the effects on performance both of the degree of salary dispersion and the bases of that dispersion. There is no literature that we know of that argues for the performance-enhancing properties of pay systems that do *not* reward on performance. Consequently, we expect to observe a relationship between productivity and the degree to which performance is rewarded, for both incentive and self-selection reasons. The effects of dispersed salaries on performance is a separate, albeit related issue. On one hand, because we are studying college and university faculty, the degree of task-related interdependence is comparatively small compared with many organizational technologies. Consequently, performance losses from reduced cooperation (Lazear, 1989) are likely to be smaller in this setting. On the other hand, wage dispersion can have a negative effect on productivity. College and university faculty are, on average, more politically liberal than the general population and have often entered the career primarily for noneconomic reasons. Consequently, salary inequality may have limited, if any effects in motivating increased productivity. And as Milgrom and Roberts (1988) noted, dispersed rewards raise the stakes for competing successfully for those rewards. This activity takes time and energy. So, it is quite possible that, as they suggest with theoretical analysis, there are efficiency properties associated with more equal rewards, where such efficiencies come from the diminished effort spent politicking and gaming the reward system and more time spent on doing actual work.

Collaborative Work

In the literature of both psychology and economics, there are arguments that increased wage dispersion negatively affects teamwork and collaboration. For instance, Lazear's (1989) arguments as to why pay compression may have important efficiency properties presume that teamwork will be adversely affected by more dispersed wages and the resulting competition for a comparatively higher wage. Summarizing a large program of experimental research, Deutsch (1985) noted that the system of reward allocation preferred by subjects depended on the prospects for future interaction. When subjects anticipated interacting with each other in the future, a more equal allocation was preferred. Deutsch (1985: 158) found that subjects working in either an equality or need (allocations were based on an individual's economic circumstances) condition of reward allocation reported having cooperative feelings toward one another, while those in either a winner-take-all or proportionality (where allocations were proportional to the individual's

performance) condition reported competitive feelings. Deutsch's results suggest that more equal reward allocations are more consistent with collaborative, interdependent working relations.

In many instances, the degree of task interdependence is largely a given, determined by the nature of the task and the technology for accomplishing it. Academic research, however, permits at least some discretion in working arrangements. Faculty members may collaborate with others or they may work alone on research. The relationship between working arrangements and wage dispersion is likely to be bidirectional. If Lazear is right, there will be less wage dispersion when there is more need for collaboration. But, at the same time, greater wage dispersion may promote interpersonal competition and make collaborative relations less likely.

METHOD

Data

The data used for this study are from the Carnegie Commission's 1969 survey of college and university faculty. The dataset consists of more than 60,000 responses from 80 percent of the faculty members of 303 colleges and universities, stratified by institutional type. The sample is described in more detail in Trow (1975) and has been used previously in a study of gender discrimination (Szafran, 1984) and a study of the effect of commitment on the relationship between salary and satisfaction (Pfeffer and Lawler, 1980). The data allow researchers to obtain measures of wage dispersion within departments and then to relate these to individual-level attitudes, performance, and working arrangements and to control for other possible correlates. Because the specific institutions are anonymous, however, introducing other, particularly organization-level control variables is more problematic.

To ensure that the measure of wage dispersion was reliable and valid, we confined our attention to those respondents in departments with a size of 20 or larger that had a response rate to the questionnaire of greater than 50 percent. Dispersion is an aggregate measure, and we needed to ensure that we were not constructing a variable based on only two or three responses, which would make it meaningless. This left a sample of more than 17,000 individuals in more than 600 academic departments. Because this restriction excludes the very smallest departments, all of the analyses reported below were repeated for departments of size 10 or larger, which did not alter any of the results.

Measures

Satisfaction. Individual attitudes reflecting satisfaction with the employing organization were measured by a scale constructed by summing the standardized scores from five separate questions: (1) whether or not the respondent thought he or she could be equally satisfied in another college or university; (2) how satisfied the respondent was with the administration; (3) how satisfied the respondent

was with his or her salary; (4) how the individual felt about the institution, with a three-point response scale ranging from "it is a very good place for me" to "it is not the place for me"; and (5) a final question that measured the respondent's intention to leave, ranging from a response indicating that the individual was not even interested in exploring outside offers to a response indicating that the individual was negotiating to leave. The five items formed a scale with a reliability of .61 (Cronbach's alpha). Each of the analyses reported below was conducted on the individual items as well as with the overall scale. The results are virtually identical, so only the overall scale results are discussed.

Productivity. Research productivity was measured by summing the standardized scores from three questions on the survey that asked the total number of articles published, the number of books published, and the number of publications in the last two years. These three items formed a scale with a reliability of .64. Because the number of publications varies substantially across the academic fields, individual productivity was normed by dividing the individual's score by the average score for all respondents within his or her academic field. This measure of productivity assesses the individual's productivity over the span of the person's entire career. To attempt to assess more precisely the effects of current salary conditions on recent productivity, we also analyzed only publications in the last two years (normed for academic field) as a function of prior productivity and other variables, including salary dispersion.

Working collaboratively on research. The measure of the extent to which people worked together collaboratively comes from a question on the survey that asked whether the person, in working on research, worked alone (coded 1), worked with one or two other colleagues (coded 2), or worked on research as a member of a larger group (coded 3). Although it is possible that people work collaboratively on research with individuals in other departments or even in other universities, much research collaboration occurs within departments because of proximity. There is no reason to expect that research collaboration occurring across rather than within departments is systematically related to the variables of interest in the study in a way that would negate our results.

We know from earlier research (Pfeffer and Langton, 1988) that collaborating on research tends to produce less salary dispersion. To handle this problem of simultaneity, we used a two-stage least-squares procedure in which we used the equation predicting salary dispersion developed by Pfeffer and Langton (1988) and entered the predicted value of salary dispersion in the equation predicting research collaboration. The equation predicting salary dispersion in each department for each individual is the one developed by Pfeffer and Langton (1988). The independent variables predicting salary dispersion are as follows: gender heterogeneity, rank heterogeneity, the coefficient of variation in experience, the coefficient of variation in productivity, department size, private control, average amount of social contact in department, democratic decision making, autocratic decision

making, percentage in department who report working alone on research, percentage in department with outside administrative appointment, percentage in department with an institute appointment, length of the chair's term, being in a low-quality 4-year college, being in a high-quality 4-year college, being in a medium-quality 4-year college, being in a low-quality university, being in a medium-quality university, 65 dummy variables representing the separate academic fields, and the coefficient of variation of salary at the organization as a whole. Because salary variation is predicted at the departmental level of analysis, and whether or not someone works collaboratively is an individual-level variable, there is no identification problem with the equations.

Salary dispersion. A question on the survey asked about the individual's pay from academic employment only, adjusted to a nine-month basis. We measured salary dispersion as the coefficient of variation (the standard deviation divided by the mean) in salaries for respondents within a given academic department. Allison (1978), reviewing a number of measures of income inequality, concluded that the coefficient of variation was preferable in most situations. For salary distributions (such as the ones in this study) that do not have the extreme outliers found in national income statistics, the coefficient of variation is correlated above .9 with other indicators of inequality such as the Gini index.

Fairness and legitimacy of salary allocations. We developed three indicators of the fairness or legitimacy of the salary-determination process. The first was the correlation (within each department) of salary with research productivity. The assumption is that since research is generally valued in academia, the stronger the relationship between research productivity and salary, the more legitimate the salary distribution would be perceived to be. The second measure was the correlation (within each department) of salary with years of teaching experience. Seniority is another potentially legitimate basis for salary allocations. Our third measure is the adjusted r^2 from a within-department regression predicting an individual's salary by years of teaching experience, academic productivity, and whether or not the individual had a terminal degree (in most fields, a doctoral degree). This last measure assesses the extent to which a department's salaries generally follow universalistic criteria.

Level of paradigm development of academic fields. We also considered consensus on evaluation of research to be another indicator of the fairness and legitimacy of evaluations. The degree to which an academic field is paradigmatically highly developed reflects the amount of consensus in the field (Lodahl and Gordon, 1972) or its level of technical certainty. We measured the level of paradigm development of a given field by constructing an index from the following variables (see Konrad and Pfeffer, 1990): (1) the average length of 15 doctoral dissertations randomly selected from *Dissertation Abstracts* in 1973, the first year in which the dissertations could be obtained on line; (2) the proportion of publications in the field that were books, obtained from the Carnegie survey; (3) the degree of control faculty members in the field, on average, felt they had over the content of their courses, obtained from a question on

the survey; (4) the average rating of the importance of teaching graduate students, obtained from the survey; and (5) the average response to a survey item asking about the desire for higher admission standards for graduate students and more stringent requirements for advanced degrees. These variables formed a scale with a reliability of .85. The first two variables measure parsimony in communications. Previous studies have argued that in fields with well-developed paradigms, communication should be more efficient because of agreement on terms and premises (Salancik, Staw, and Pondy, 1980; Pfeffer and Moore, 1980). The degree of faculty control indicates the extent to which there is an agreed knowledge base in the field or, alternatively, whether the faculty has more discretion over course content. Giving high importance to training graduate students and wanting somewhat lower standards for admission and advanced degrees indicate that faculty members desire more contact with students and want more students in their programs. Lodahl and Gordon (1972) have argued that this willingness to work with students is an indicator of high paradigm development. The separate elements of our measure of paradigm development have all been used previously, make sense given the conceptualization of the construct, and load on a single factor with excellent scale reliability. The scale is constructed so that lower scale values indicate a higher degree of paradigm development, and higher numbers represent fields with less-developed paradigms.

Information and commitment. The amount of information available to survey respondents was assessed in three ways. First, institutions were coded from information provided on the questionnaire as either public or private, using a dummy variable with public as the omitted category. Second, communication with people in other institutions was measured by a single item on the survey that asked how frequently the respondent communicated with people in the same academic field but in other institutions. Finally, social contact within the department was assessed by a question that asked respondents the proportion of people they saw outside of work who were from their own departments, with the response scale ranging from "almost none" to "almost all."

Commitment to the institution was assessed in two ways. Institutional tenure was measured by a question that asked how long respondents had worked in their current job. A dummy variable coded 1 indicated if a person was the department chair. These measures, which are correlates of commitment that have been used in other studies (e.g., Katz, 1978; Pfeffer and Lawler, 1980), are used here in the absence of questionnaire items that would measure commitment more explicitly.

Control Variables

Research productivity. Because total research productivity is obviously affected by the length of time one has to be productive, we controlled for the number of years the individual has been teaching in a college or university. Research productivity is also affected by the level of one's

training, and so the equation estimating it included a dummy variable for whether or not the person had a terminal degree. There is evidence that research productivity is related to gender, possibly because of extra nonwork demands on women faculty or possibly because of discriminatory access to resources at work (Reskin, 1978). We thus included a dummy variable for gender, with male being the omitted category.

One's ability to be productive is also related to the environment in which one works, with that environment potentially providing material resources, colleagues, and social support and a normative environment that encourages research productivity. For instance, Long and McGinnis (1981), in a longitudinal study of biochemists, found that one's location in the hierarchy of academic institutions affected research productivity. Their study showed that location affected productivity more strongly than productivity affected the type and quality of one's academic appointment. This study was recently extended to other academic fields, with the same conclusions (Allison and Long, 1990). The Carnegie data report institutional quality and type as assessed by the Gourman (1967) *Report*. Respondents were categorized as working in a junior college, in a four-year college, in a low-quality university, a medium-quality university, or a high-quality university. We combined the two categories of low- or medium-quality university, defined dummy variables for each institutional category, and used low- or medium-quality university as the omitted category. We also controlled for whether the institution was public or private.

Because we examined the effect of wage dispersion on satisfaction, and it is possible that satisfaction is related to performance, we included satisfaction in the estimated equation. The other coefficients are the same when the equation is estimated without satisfaction included. We also estimated equations for both total productivity and for recent research productivity (the past two years only), controlling for prior productivity in addition to the other variables mentioned above.

Satisfaction. Obviously, many factors other than salary dispersion can affect one's satisfaction with one's job and institution. We therefore developed an equation explaining variation in satisfaction that included as many plausible predictors of satisfaction as were available from the survey and included all of the main effects for the interactions we examined. Commitment to the institution should affect satisfaction. In addition to being a chairperson, it is likely that holding another institutional administrative position will create more commitment to the university and consequently more satisfaction. People who have received degrees from the school at which they are presently teaching have two relations with the organization: as an employee and as an alumnus. The additional connection would lead one to expect that people teaching at the place from which they have received other degrees would, other things being equal, be more satisfied with their jobs. We examined the effect of the number of institutions at which the individual had taught. It is possible that there is more efficient sorting

and matching of people with jobs, the greater the number of institutions at which one has taught. It is also possible that teaching at a number of institutions reflects not so much finding an appropriate match but, rather, the difficulty of doing so. In either event, we thought it important to control for this factor. We also included gender and race in the equation predicting job satisfaction. Because there is some literature that suggests that larger organizations are less personal and more alienating than smaller ones, we included department size in the predictive equation to control for this possibility. A question on the survey assessed the extent to which the department was governed autocratically. The question was asked: "Do you feel that the administration of your department is: very autocratic, somewhat autocratic, somewhat democratic, or very democratic?" Given norms of faculty governance emphasizing participation and collegiality, we expected that departments that were more democratic would be associated with higher levels of reported satisfaction.

Recently there has been evidence that demographic heterogeneity, for instance, in organizational tenure and age, is associated with less social cohesion in the organization. Wagner, Pfeffer, and O'Reilly (1984) found there was more turnover in top-management team groups to the extent there was more heterogeneity in organizational tenure. More recently, O'Reilly, Caldwell, and Barnett (1989) explored the underlying mechanism producing this effect and, consistent with the original theoretical predictions, found that heterogeneity in group tenure decreased social integration and, as a consequence, produced more turnover. The importance of these findings for the present study is clear. It is likely that heterogeneity in gender, institutional tenure, and academic rank are associated with less social cohesion and, as a consequence, possibly diminished job satisfaction. But, because these same factors are obviously also associated with salary dispersion, it is important to control them to ensure that the effects of salary dispersion on satisfaction are not because of the association between salary dispersion and these other demographic factors.

RESULTS

Correlations among the variables are displayed in the Appendix.

Although satisfaction is itself an important feature of the workplace (Freeman, 1978), many readers are likely to feel that if dispersion has a positive effect on research productivity, other outcomes are of less importance. Consequently, we present the results of the productivity equations first and then examine the effect of wage dispersion on job satisfaction and on working collaboratively.

Research Productivity

Table 1 presents the results for estimating two regression equations—total research productivity and recent research productivity. The control variables work as one might expect. Total years of experience has a large effect on total research productivity but an insignificant effect on recent research productivity. Having a terminal degree and being in a

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high-quality university both positively affect productivity, while being female and being in a four-year college or junior college (compared with a medium- or low-quality university) negatively affect productivity. Satisfaction is positively related to productivity, although given that the data are cross-sectional, it may be that more productive people are more satisfied as a consequence rather than that satisfaction causes productivity. As one might expect, each of these variables has a larger effect on total productivity than on recent productivity. Past productivity is an important predictor of research publication in the most recent two years.

Table 1

Regressions Explaining Individual-level Research Productivity, Normed by Academic Field (N = 19,989)*

	Dependent Variable	
Variable	Research productivity	Recent research productivity
Salary dispersion	$-.378$***	$-.146$***
	(.160)	(.022)
Experience (years)	.104***	.00042
	(.002)	(.00028)
Has terminal degree	1.372***	.224***
	(.039)	(.006)
Female	$-.395$***	$-.049$***
	(.050)	(.007)
Private school	$-.009$	.002
	(.042)	(.006)
High-quality university	.483***	.049***
	(.036)	(.005)
Four-year college	$-.182$***	$-.056$***
	(.059)	(.008)
Junior college	$-.511$**	$-.165$***
	(.189)	(.027)
Satisfaction	.040***	.002**
	(.005)	(.027)
Correlation of salary with productivity	.843***	.055***
	(.086)	(.012)
Past productivity	–	.154***
		(.005)
Constant	-2.07	$-.485$
Adjusted R^2	.26	.16

** $p < .01$; *** $p < .001$.
* Standard errors are in parentheses.

The two variables of most interest are salary dispersion and the correlation of salary with productivity within each department. The results indicate that for both total productivity and for recent productivity, salary dispersion is negatively related to research performance. And, in both instances, being in a department in which salary is correlated more strongly with productivity is positively associated with research performance. When we reestimated the equation, this time substituting the correlation of salary with years of college teaching experience for the correlation of salary with research productivity, we found the same pattern of results: a negative effect of salary dispersion and a statistically significant positive effect of the correlation of experience with salary. Pfeffer and Langton (1988) reported that

variation in productivity among department members was not related to wage dispersion in the departments. This suggests that the dispersion observed is not the result of differences in variation in productivity among faculty members in different departments.

We also estimated separate equations for the number of articles published and the number of books, normed by academic field. The data do not permit separate estimates of recent and overall productivity for these measures but only of overall productivity. Although there were some differences between the two equations—for example, the amount of total experience in academia is more strongly related to the number of books published compared with the number of articles, and being a woman is positively related to the number of articles published but negatively to the number of books—for the two variables of interest, the results are the same as already reported. In both instances, the amount of salary dispersion showed a statistically significant negative relationship to productivity, and in both instances (articles and books) the correlation of salary with productivity within the department was positively related to the publication of articles and books. Thus, our results appear to be robust when we consider the different forms academic publication can take.

In large sample studies such as this one, one needs to examine the substantive importance of the results as well as their statistical significance. Examining the standardized coefficients (not reported for reasons of space), we found that the standardized effect of salary dispersion on recent productivity was as large as the effect of working in a four-year college, working in a junior college, and being a woman and is more than twice the effect of satisfaction. The standardized effect of salary dispersion is about 50 percent larger than the effect of the correlation of salary with research productivity in each department (.048 versus .032). The effect of salary dispersion is much less than that of past productivity and having a terminal degree and is a little more than half the size of the effect of working in a high-quality university. The relative size of the standardized effect of salary dispersion, then, indicated that it is substantively important as well as being statistically significant.

The simple correlation of salary dispersion with the correlation of salary with research productivity within each department is only .31, so it is unlikely that the results are caused by multicollinearity between these two variables. Rather, the pattern of results for performance has a straightforward but substantively important interpretation. First, increased variation in salary is not associated with either higher overall research productivity or higher levels of recent research productivity, controlling for the individual's past research performance. These results suggest, at least for this sample, that settings in which salaries are more dispersed do not yield more productive individuals. There is evidence in our data that pay-for-performance salary regimes—a higher correlation of salary with productivity within departments—are associated with higher research productivity. The fact that pay for experience shows the

same effect, however, is consistent with the following interpretation. Pay for performance may have some of its productivity-enhancing effect not because of its motivational or selection properties but because pay for performance (or pay for seniority) is an equitable and fair basis of salary allocation, and the fairness of the allocation system, rather than its specific content, may be the crucial factor. The results are consistent with the idea that salary variation is dysfunctional, at least in this context, and that one can achieve some of the benefits of equitable pay regimes without also necessarily having to incur the negative consequences of widely dispersed salaries.

Satisfaction

Table 2 presents the results of an equation predicting job satisfaction that includes salary dispersion and 19 control variables. The control variables all work pretty much as expected. Satisfaction is positively related to the individual's salary, to being a departmental chair or holding another university administrative position, to the number of degrees received from the institution at which the person is teaching, and to the length of service at the local institution. It is also positively related to the amount of social contact the individual has with other members of the department or others outside the institution but in the same field, and to being in a high-quality university or a four-year or junior college, compared with being in a medium- or low-quality university. Women and whites reported higher satisfaction. People in autocratic departments were less satisfied, as were people in more gender-integrated departments, a finding that accords with Wharton and Baron's (1987) results. In all of the analyses reported subsequently on satisfaction (including those displayed in Tables 3 and 5), we controlled for all of these factors. We do not report the results each time for the various controls, but only for the variables of substantive interest.

Our main result is that salary dispersion has a statistically significant negative relationship with satisfaction. Once again, salary dispersion is substantively important. The largest standardized effects on satisfaction are for salary and length of employment in the current institution, respectively. Salary dispersion is the sixth largest standardized effect (after being a woman, working in a department governed autocratically, and working in a high-quality university) and is larger than the effects of social interaction outside of work, being a departmental chair, working in another administrative position, or the number of degrees held from the institution of current employment. As in the case of research productivity, salary dispersion is not the most important factor, but it is substantively important in affecting satisfaction.

Our original hypotheses argued for both two-way and three-way interactions between salary dispersion, location in the salary distribution, and other mediating factors. The literature suggests that the negative effects of salary dispersion on satisfaction will be diminished for those more committed to the organization, in situations in which salaries are less likely to be known, and when salaries are distributed more equitably. We also argued that people who earned less

Table 2

Multiple Regression Estimating a Model of Job Satisfaction
(N = 17,444)

Variable	Coefficient	Standard error
Coefficient of variation of salaries in dept.	-1.536^{***}	.263
Salary	$1.720 \times 10^{-4***}$	5.944×10^{-6}
Level of paradigm development	.045	.052
Private institution	.018	.058
High-quality university	$.533^{***}$	.052
Four-year college	$.337^{***}$	.077
Junior college	1.126^{***}	.254
External communication	$.059^{*}$	.024
Social contact in dept.	$.152^{***}$	.021
Tenure	$.063^{***}$	.003
Chairperson	$.679^{***}$	.103
Outside administrator	$.375^{***}$	.054
Number of institutions at which taught	$-.071^{***}$	.021
Number of degrees from present institution	$.221^{***}$	.054
Gender (1 = woman)	$.707^{***}$	.071
Race (1 = white)	$.793^{***}$	.130
Variation in length of tenure in institution	$-.058$	.128
Rank heterogeneity	1.236^{***}	.299
Gender heterogeneity	$-.642^{***}$	.175
Autocratic dept.	$-.519^{***}$	.053
Dept. size	.001	.004
Constant	-3.514	
Adjusted R^2	.18	

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

would be less satisfied when confronted with more dispersed salaries than those who earned more and that the moderating effects of information, fairness, and commitment would be felt more strongly for those who earned less.

In Table 3, we present the results of a set of analyses exploring the two-way interactions. The first column presents all of the interactions except those with a measure of fairness in salary allocations. The next three columns explore, one at a time, the interactions (as well as the main effects) of the various measures of salary determination within departments. For the most part, the predicted interactions are observed. People working in fields with more highly developed scientific paradigms are less negatively affected by salary dispersion, as are those with longer institutional tenure and those in private institutions. We did not find evidence that social contact with colleagues inside the department or communication with colleagues outside the university affects one's reaction to salary dispersion. It may be that these social contacts are not an appropriate forum for discussing salaries and thus do not provide additional information about salary.

An unexpected finding in Table 3 is the sign of the interaction of salary dispersion with salary, indicating that the negative effects of dispersion on satisfaction are greatest for high earners. This result is inconsistent with our hypothesis that it would be those with lower salaries who would be most negatively affected by dispersion, because of their

Table 3

Two-way Interaction and Main Effect of Salary Dispersion on Satisfaction

	(1)	(2)	(3)	(4)
Salary dispersion	-1.16^{**}	$-.993^{***}$	$-.969^{***}$	-1.10^{***}
	(.280)	(.287)	(.283)	(.288)
Salary dispersion × salary	$-1.30 \times 10^{-4**}$	$-1.25 \times 10^{-4**}$	$-1.24 \times 10^{-4**}$	$-1.31 \times 10^{-4***}$
	(4.71×10^{-5})	(4.71×10^{-5})	(4.71×10^{-5})	(4.71×10^{-5})
Salary dispersion × tenure	$.07^{**}$	$.078^{**}$	$.077^{**}$	$.077^{**}$
	(.03)	(.027)	(.027)	(.027)
Salary dispersion × paradigm	-1.25^{**}	-1.03^{*}	$-.981^{*}$	-1.04^{*}
	(.42)	(.42)	(.42)	(.42)
Salary dispersion × private	1.45^{**}	1.71^{**}	1.61^{**}	1.56^{**}
	(.51)	(.56)	(.55)	(.52)
Salary dispersion × chair	1.27	1.25	1.32	1.26
	(.96)	(.96)	(.96)	(.96)
Salary dispersion × outside communication	$-.207$	$-.181$	$-.196$	$-.204$
	(.206)	(.206)	(.206)	(.206)
Salary dispersion × social contact	$-.010$	$-.052$	$-.058$	$-.030$
	(.172)	(.173)	(.172)	(.172)
Adjusted r^2 from within-dept. regression	–	$-.387^{***}$	–	–
		(.115)		
Correlation of salary with experience	–	–	$-.468^{***}$	–
			(.112)	
Correlation of salary with productivity	–	–	–	$-.420^{***}$
				(.114)
Salary dispersion × adjusted r^2	–	2.11^{*}	–	–
		(.879)		
Salary dispersion × correlation with experience	–	–	2.18^{**}	–
			(.85)	
Salary dispersion × correlation with productivity	–	–	–	2.47^{***}
				(.908)

$^*p < .05$; $^{**}p < .01$; $^{***}p < .001$.

place at the bottom of the distribution. The results of a split sample regression, with the samples defined on the basis of mean salary, however, revealed that there was a large negative effect of salary dispersion on satisfaction for those with lower salaries and no effect for those with higher salaries, a result consistent with our arguments. To explore this anomaly, we first examined the data to see whether or not there were outliers on either salary or salary dispersion that were producing the Table 3 results. There were not. Table 4 presents mean values for a number of the variables for categories of salary level and salary dispersion, constructed by taking the lowest third and highest third for both salary and salary variation. The values in this table for satisfaction are also consistent with our predictions: On average, lower-paid people are less satisfied than those who earn more, and the biggest difference between low- and high-salary variation occurs for those earning less money. The ordering of the means is as we expected: The most unhappy are those who earn less money and are in more dispersed salary distributions; next most unhappy are those who earn less money but who are in less dispersed salary distributions; people who earn more and are in low salary-variation conditions are happy; and the most satisfied are the high earners in more dispersed distributions, because these are the people who are comparatively the best off.

Looking at some of the other means helps us understand why we observed the unexpected result in the multiple

Table 4

Means for Selected Variables under Different Conditions of Salary Variation and Salary*

Variable	Low salary high variation (N = 4067)	Low salary, low variation (N = 3015)	High salary, low variation (N = 2012)	High salary, high variation (N = 2495)
Satisfaction	−1.345	−.661	1.17	1.33
Salary	7,182	9,263	17,325	18,723
Salary variation	.482	.247	.254	.451
Female	.23	.23	.04	.03
High-quality university	.547	.159	.337	.670
Dept. size	29.2	27.1	27.8	28.0

* High and low conditions represent top and bottom third respectively.

regressions. Because the lower-salaried, higher-variation respondents are also more often women and located in high-quality universities, factors that increase satisfaction, we obtained the unexpected result that higher variation and lower salary may increase satisfaction. The interaction of institutional quality and gender makes it difficult to obtain unambiguous results, but both the means reported in Table 4 and the split sample regression results (not reported for reasons of space) are consistent with the predictions. We also re-estimated the equation in column 1 of Table 3, first leaving out gender and quality of university, then with just gender included, and then including just quality, each time including all of the other variables. The results are virtually identical to those reported in the table, including for the salary by salary-dispersion interaction.

All three measures of salary allocation within departments have the same pattern of results. In all three cases, the stronger the correlation of salary with either experience or research productivity, and the higher the amount of variation explained in salary allocations by a simple regression equation including experience, research productivity and holding a terminal degree, the less affected people were by salary dispersion. But in all three instances the main effects of these variables on satisfaction were negative. This means that salary dispersion is more readily tolerated when it is produced by an equitable system of allocation, but people still prefer salaries that are less closely tied to either experience or research productivity.

In Table 5, we present the results from regressions estimating three-way interactions that include the level of the individual's salary. Although not shown in the table, each model includes the corresponding two-way interactions as well as all main effects. We find the same general pattern of results as above—statistically significant three-way interactions for salary dispersion and salary level with private institution, institutional tenure, and the level of paradigm development. Again, the interactions are in the predicted direction, with the results indicating that it is the lower-salaried individuals who are most affected.

To test whether or not the interactions contributed significantly compared with the baseline model in Table 2, we computed F-tests for the additions of the interactions. The F-value for model 1 in Table 3 compared with Table 2 is

Table 5

Three-way Interactions and Main Effect of Salary Dispersion on Satisfaction

	(1)	(2)	(3)	(4)
Salary dispersion	-1.60****	-1.31****	-1.28****	-1.48****
	(.331)	(.336)	(.336)	(.336)
Salary dispersion × salary	-1.12×10^{-4}**	-1.45×10^{-4}***	-1.04×10^{-4}**	-1.48×10^{-4}***
	$(.053 \times 10^{-4})$	$(.540 \times 10^{-4})$	$(.053 \times 10^{-4})$	$(.549 \times 10^{-4})$
Salary dispersion × salary × paradigm development	2.57×10^{-4}****	3.01×10^{-4}****	2.84×10^{-4}****	2.86×10^{-4}****
	$(.073 \times 10^{-4})$	$(.740 \times 10^{-4})$	$(.737 \times 10^{-4})$	$(.750 \times 10^{-4})$
Salary dispersion × salary × private	-4.10×10^{-4}****	-1.88×10^{-4}*	-2.88×10^{-4}***	-3.52×10^{-4}****
	$(.089 \times 10^{-4})$	(1.09×10^{-4})	(1.03×10^{-4})	$(.933 \times 10^{-4})$
Salary dispersion × salary × tenure	-1.21×10^{-5}**	-1.33×10^{-5}***	-1.38×10^{-5}***	-1.24×10^{-5}***
	$(.48 \times 10^{-5})$	$(.488 \times 10^{-5})$	$(.049 \times 10^{-5})$	$(.483 \times 10^{-5})$
Salary dispersion × salary × department chair	3.24×10^{-4}*	3.27×10^{-4}*	3.18×10^{-4}*	3.06×10^{-4}
	(1.98×10^{-4})	(1.97×10^{-4})	(1.98×10^{-4})	(1.98×10^{-4})
Salary dispersion × salary × social contact	$.058 \times 10^{-4}$	$-.078 \times 10^{-4}$	$-.004 \times 10^{-4}$	$-.002 \times 10^{-4}$
	(.318)	(.319)	$(.032 \times 10^{-4})$	$(.032 \times 10^{-4})$
Salary dispersion × salary × outside communication	1.01×10^{-4}***	$.974 \times 10^{-4}$***	$.958 \times 10^{-4}$***	$.899 \times 10^{-4}$**
	$(.367 \times 10^{-4})$	$(.368 \times 10^{-4})$	$(.367 \times 10^{-4})$	$(.368 \times 10^{-4})$
Adjusted r^2	–	$-.382$****	–	–
		(.115)		
Salary dispersion × salary × adjusted r^2	–	6.66×10^{-4}***	–	–
		(1.84×10^{-4})		
Correlation of salary with experience	–	–	$-.472$****	–
			(.112)	
Correlation of salary with research productivity	–	–	–	$-.384$****
				(.115)
Salary dispersion × salary × salary with experience	–	–	4.12×10^{-4}**	–
			(1.64×10^{-4})	
Salary dispersion × salary × salary with productivity	–	–	–	4.81×10^{-4}**
				(1.91×10^{-4})

* $p < .10$; ** $p < .05$; *** $p < .01$; **** $p < .001$.

4.36, significant at $p < .001$. The F-value for model 1 in Table 5 compared with Table 2 is 4.83, again significant at $p < .001$. Finally, comparing model 1 in Table 3 with model 1 in Table 5 produced an F-value of 5.39 ($p < .001$). We did not compare models within the tables, but the overall pattern of results is that the models with more interactions show statistically significant improvement over the models without them.

The overall evidence from Tables 3–5 is generally consistent with our hypotheses concerning the factors that mediate the effects of salary dispersion on attitudes. Perceived fairness in reward allocation and consensus concerning the criteria for evaluation decrease dissatisfaction with salary dispersion. Commitment mediates the effects of salary dispersion, with those with longer tenure at an institution being less dissatisfied with a given level of dispersion. The effects of the information measures are also generally consistent with our predictions. People in public institutions exhibit more dissatisfaction when salaries are more dispersed, as do those who communicate more frequently with colleagues in other institutions. In the case of social contact inside the department, the absence of an effect may be the result of two countervailing forces. On the one hand, greater informal social communication with other department members is probably going to produce more information about how others are faring. On the other hand, social contact builds bonds of social cohesion, and these social ties may make dispersed salaries more readily tolerated. It is one thing to be confronted with unequal rewards; it is quite another if those rewards are going to my friends, people I socialize

with on a regular basis. It may also be the case that social contact makes it possible to evaluate the justifications for dispersed salary more completely by producing more information about the productivity of one's colleagues.

Research Collaboration

Table 6 presents the results from two regressions explaining individuals' tendency to work on research collaboratively or by themselves.

Table 6

Regressions Explaining Individuals Working on Research Independently or Collaboratively ($N = 12,366$)

Variable	(1)	(2)
Predicted salary dispersion	$-.197$**	$-.134$*
	(.078)	(.079)
Level of paradigm development	$-.268$****	$-.271$****
	(.011)	(.011)
Gender heterogeneity	$-.100$**	$-.099$**
	(.040)	(.040)
Variation in length of tenure in institution	$-.092$***	$-.076$**
	(.030)	(.030)
Dept. size	-7.71×10^{-4}	-5.6×10^{-4}
	(8.11×10^{-4})	(8.11×10^{-4})
Social contact in dept.	$-.013$***	$-.012$**
	(.005)	(.005)
Tenure (years)	$-.002$***	$-.003$****
	(.001)	(.001)
Number of degrees from present institution	$.056$****	$.057$****
	(.007)	(.007)
Number of institutions at which taught	$-.032$****	$-.031$****
	(.005)	(.005)
External communication	$.072$****	$.072$****
	(.006)	(.006)
Private	$.012$	$.011$
	(.014)	(.014)
High-quality university	$.062$****	$.067$****
	(.012)	(.012)
Four-year college	$.003$	$-.003$
	(.018)	(.018)
Junior college	$.022$	$-.010$
	(.094)	(.094)
Correlation of salary with productivity	$-$	$-.140$****
		(.025)
Female	$.094$****	$.094$****
	(.019)	(.019)
White	$.021$	$.023$
	(.030)	(.030)
Salary	1.51×10^{-5}****	1.55×10^{-5}****
	(1.42×10^{-6})	(1.42×10^{-6})
Constant	1.21	1.23
Adjusted R^2	$.11$	$.11$

* $p < .10$; ** $p < .05$; *** $p < .01$; **** $p < .001$.

Again, the control variables have the expected effects. There is less collaboration in departments that are heterogeneous either in terms of gender composition or in length of time in the department. These results are consistent with other studies demonstrating the importance of demographic similarity for understanding organizational processes (e.g., Pfeffer, 1983; Wagner, Pfeffer, and O'Reilly, 1984; O'Reilly, Caldwell, and Barnett, 1989). As expected, fields that are paradigmatically more developed have much more

collaboration on research, and this is by far the most important effect on collaboration. Paradigm development, with the consensus and communication efficiency entailed, makes collaboration on research much easier and therefore more likely. Two unexpected results were that social interaction was negatively related to research collaboration, as was length of tenure in the current institution. We expected social cohesion to facilitate research collaboration, and since it takes time to develop collaborative relationships, length of time in the institution would likewise be positively related. Alternative explanations for both effects come to mind. Research collaboration may provide enough social contact so that individuals then choose to socialize outside of work with others. And it may be newcomers to departments who most need collaborative relationships to access resources, to learn the norms, and to accomplish their research.

As predicted, the instrumental variable for salary dispersion is negatively related to working on research collaboratively, even with all other factors controlled. The correlation of salary with productivity is also negatively related to working on research collaboratively. This suggests that there is an association between paying for performance and research collaboration, with there being less tendency to pay for performance in collaborative settings and with there being less research collaboration when salary is more strongly related to research productivity.

DISCUSSION

Economists have puzzled over why workers are not paid the value of their marginal products (Frank, 1984) or why pay systems are not more closely tied to performance, even when conditions of information make it feasible. Lazear (1989) and Milgrom and Roberts (1988), among others, have argued that there are important efficiency properties that emerge from more compressed pay distributions than would be implied by the strict application of a proportionality principle. The evidence in this study is quite consistent with this latter view.

We examined three separate dependent variables: research productivity, satisfaction, and working collaboratively on research. In all three instances, controlling for numerous other predictors, we observed statistically and substantively significant negative effects of pay dispersion. People were less satisfied, there was less collaboration on research, and research productivity and recent research output were lower the more dispersed pay distributions were. We also found mixed evidence for the effects of our pay-for-performance measures (higher correlations of pay with either productivity or experience). Although tying pay to performance was positively associated with research performance and recent research productivity, it was negatively associated with both satisfaction and with working collaboratively.

Our results also suggest that studies of pay determination and its effects need to be careful to distinguish among three dimensions of reward systems: (1) the extent to which salaries are allocated on the basis of performance; (2) the

extent to which salaries are allocated on some legitimate basis, such as experience, but also performance; and (3) the extent to which the resulting distribution of salary is dispersed or compressed. It is important to recognize that it is possible to base salary on performance but to have returns for performance be less than proportional, so that salary is compressed to some degree. It is also crucial to recognize that linking salary to performance may have effects because of the legitimacy of performance as a criterion. Studies might do well to consider whether similar effects are observed for other legitimate criteria such as years of experience, which is what we found in this particular sample.

The third conclusion that emerges from the data is that studies of the effects of pay systems need to pay close attention to both the particular context and to factors that moderate the relationship between pay and its outcomes. Our study involves a particular setting, colleges and universities, which, on the one hand, features reasonably objective performance measures and comparatively low interdependence in work activities for faculty, but, on the other hand, would not necessarily attract those seeking to maximize their lifetime earnings. It is quite likely that the effect of pay dispersion and pay-performance linkage varies depending on the degree of interdependence of the task and technology, the values, norms, and attitudes of those entering the organization or occupation, and the ease of evaluating the work output.

It is clearly the case that reactions to pay dispersion vary depending on the extent to which information about pay is likely to be known, the degree of the individual's investment and commitment to the organization, the individual's own outcomes in the distribution of salaries, and the extent to which technological certainty and consensus about standards and methods resolves uncertainty in the evaluation process. Not surprisingly, we found that a person's affective reaction to wage dispersion was contingent on these factors of information, commitment, consensus and certainty in the evaluation process, and where his or her own pay fell in the distribution. These results suggest that studies of pay systems, pay distributions, and their effects would profit from dropping the assumption that these effects are universal and exploring the factors that create differences in how people respond to both differences in pay determination and wage dispersion.

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APPENDIX: Correlations among the Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Satisfaction											
2. Salary variation	-.0828										
3. Salary	.3468	-.1354									
4. Paradigm	-.0261	.0209	-.1031								
5. Private	.0313	.1556	.0613	.0274							
6. High qual. univ.	.0999	.2991	.1175	.0346	.1884						
7. 4-year inst.	-.0100	-.1434	-.0681	.0376	.1018	-.2542					
8. Jr. college	.0321	-.1016	-.0229	.0554	-.0455	-.0731	-.0281				
9. External communication	.1336	-.0697	.3614	-.1554	.0456	.0774	-.0733	-.0483			
10. See dept. socially	.0134	.0346	.0068	.0037	-.1125	-.0373	-.0191	-.0477	.0602		
11. Tenure	.2900	-.0539	.4125	-.0697	.0255	.0305	-.0530	.0032	.1062	-.0912	
12. Chair	.1348	-.0260	.2457	.0083	.0299	-.0082	-.0053	.0018	.1203	-.0001	.1384
13. Outside administration	.1004	-.0067	.1439	.0133	.0687	.0344	-.0231	-.0170	.0730	-.0864	.0994
14. No. inst. taught	.0693	-.0493	.3472	.0277	-.0360	-.0484	-.0158	-.0367	.1888	.0730	.0672
15. No. degrees from inst.	.0824	.0001	-.0319	.0006	.0408	.0857	-.0344	-.0440	-.0378	-.1128	.1643
16. Female	-.0293	.0379	-.2782	.1600	-.0015	-.0469	.0179	.0411	-.1135	-.0674	-.0741
17. White	.0638	-.0264	.0398	.0105	-.0063	-.0197	.0030	.0048	.0062	.0062	.0684
18. Var. inst. exper.	-.0996	.4248	-.1634	.1699	-.0742	.0051	-.0005	-.0239	-.1056	.1067	-.1661
19. Rank heterogen.	-.0863	.5311	-.2646	.1427	.0010	.0345	.0278	.2094	-.1479	-.0230	-.0928
20. Gender heterogen.	-.0868	.2462	-.2014	.3114	-.0386	-.1044	.0274	.0653	-.1224	-.0225	-.0657
21. Autocratic dept. head	-.1006	.1940	-.1047	.0234	.0968	-.0200	.0098	-.0565	-.0597	-.0434	-.0362
22. Dept. size	-.0175	.1795	-.0340	.0699	-.1502	.0744	-.0234	.0192	-.0718	.1256	-.0142
23. r of sal. w/prod.	-.0480	.3122	-.0030	.0025	-.0389	.1182	-.1263	-.1638	.0018	.0631	-.0383
24. r of sal. w/exp.	-.0480	.1711	-.0631	.0904	-.2075	.0947	.0789	.0092	-.0575	.1104	-.0501
25. Adjusted R^2	-.0771	.3161	-.0929	.0408	-.2121	-.0035	.0044	-.0561	-.0808	.1152	-.0549
26. Productivity	.1877	-.0123	.5393	-.0155	.0410	.1324	-.0617		.4020	.0131	.2913
27. Collaboration	.1159	-.0323	.1664	-.2568	.0701	.0729	-.0324	-.0154	.1781	-.0598	.0743
Mean	-.021	.354	12357.942	-.067	.204	.398	.089	.008	2.804	2.588	8.083
S.D.	(3.136)	(.113)	(4909.360)	(.454)	(.403)	(.490)	(.285)	(.089)	(.981)	(1.068)	(8.041)

Variable	12	13	14	15	16	17	18	19	20	21	22
13. Outside admin.	.0326										
14. No. inst. taught	.0845	.0009									
15. No. degrees from inst.	.0028	.0044	-.1905								
16. Female	-.0228	-.0548	-.0892	.0411							
17. White	.0190	.0103	-.0057	.0294	-.0137						
18. Var. inst. exp.	-.0252	-.0455	.0195	-.0821	.0484	-.0159					
19. Rank heterogen.	-.0104	-.0145	-.0999	.0111	.1758	-.0150	.3926				
20. Gender heterogen.	.0079	.0038	-.0039	-.0427	.3317	.0054	.2193	.4543			
21. Autocratic dept. head	.0062	-.0094	-.0905	.0333	.0558	-.0006	.1606	.2741	.1174		
22. Dept. size	-.0720	-.0630	.0469	-.0377	-.0276	-.0209	.1687	.0167	-.0077	-.0299	
23. r of sal. w/prod.	-.0195	-.0177	.0709	-.0096	-.0002	-.0046	.2332	.0733	.0653	-.0097	.1339
24. r of sal. w/exp.	-.0435	-.0641	.0912	-.0724	.0137	.0031	.2425	.0603	.0514	-.2072	.3290
25. Adjusted R^2	-.0463	-.0678	.0868	-.0623	.0251	-.0036	.3481	.1554	.1385	-.1262	.3237
26. Productivity	.1278	.0719	.3303	-.0243	-.1644	.0128	-.0618	-.1266	-.0825	-.0767	.0511
27. Collaboration	.0549	.0644	-.0474	.0840	-.0215	.0073	-.1354	-.0506	-.1251	.0462	-.0811
Mean	.059	.140	1.532	.416	.132	.970	.970	.741	1.70	2.194	27.981
S.D.	(.236)	(.423)	(1.160)	(.779)	(.339)	(.171)	(.196)	(.101)	(.146)	(.404)	(6.219)

Variable	23	24	25	26	27
24. r of sal. w/exp.	.3615				
25. Adjusted R^2	.5860	.7838			
26. Productivity	.0789	.0630	.0341		
27. Collaboration	-.0910	-.1884	-.1881	.1103	
Mean	.534	.578	.527	.444	1.455
S.D.	(.199)	(.219)	(.223)	(2.585)	(.613)